ADB

Technical Assistance Report

Project Number: 49048-001
Capacity Development Technical Assistance (CDTA)
December 2016

Islamic Republic of Pakistan: Institutional Transformation of the Punjab Irrigation Department to a Water Resources Department

(Cofinanced by the Japan Fund for Poverty Reduction)

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 15 November 2016)

Currency unit	–	Pakistan rupee/s (PRe/PRs)
PRe1.00	=	$0.00954
$1.00	=	PRs104.80

ABBREVIATIONS

ADB	–	Asian Development Bank
DRM	–	disaster risk management
IWRM	–	integrated water resources management
PID	–	Punjab Irrigation Department
TA	–	technical assistance
WRD	–	water resources department
WRIS	–	water resources information system

NOTES

(i) The fiscal year (FY) of the Government of Pakistan ends on 30 June. “FY” before a calendar year denotes the year in which the fiscal year ends, e.g., FY2016 ends on 30 June 2016.

(ii) In this report, "$" refers to US dollars.

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CAPACITY DEVELOPMENT TECHNICAL ASSISTANCE AT A GLANCE

1. Basic Data

Project Number: 49048-001

Project Name	Institutional Transformation of the Punjab Irrigation Department to a Water Resources Department	**Department /Division**	CWRD/CWER
Country	Pakistan	**Executing Agency**	Punjab Irrigation Department

2. Sector

	Sector	Subsector(s)	Financing ($ million)
✓	Agriculture, natural resources and rural development	Agricultural drainage	0.40
		Irrigation	0.80
		Rural flood protection	0.60
		Rural water policy, institutional and capacity development	0.40
		Water-based natural resources management	0.30
		Total	**2.50**

3. Strategic Agenda

Strategic Agenda	Subcomponents
Inclusive economic growth (IEG)	Pillar 2: Access to economic opportunities, including jobs, made more inclusive
Environmentally sustainable growth (ESG)	Disaster risk management Natural resources conservation

Climate Change Information

Adaptation ($ million)	0.05
Climate Change impact on the Project	Low

4. Drivers of Change

Drivers of Change	Components
Governance and capacity development (GCD)	Institutional development Institutional systems and political economy
Knowledge solutions (KNS)	Pilot-testing innovation and learning
Partnerships (PAR)	Civil society organizations Official cofinancing

Gender Equity and Mainstreaming

Some gender elements (SGE)	✓

5. Poverty and SDG Targeting

Project directly targets poverty and SDGs	No

Location Impact

Rural	High
Urban	Low

6. TA Category: A

7. Safeguard Categorization Not Applicable

8. Financing

Modality and Sources	Amount ($ million)
ADB	**0.50**
Capacity development technical assistance: Technical Assistance Special Fund	0.50
Cofinancing	**2.00**
Japan Fund for Poverty Reduction	2.00
Counterpart	**0.00**
None	0.00
Total	**2.50**

9. Effective Development Cooperation

Use of country procurement systems	No
Use of country public financial management systems	No

I. INTRODUCTION

1. The Punjab Irrigation Department (PID) was established in 1849 for diverting water from rivers to farms for irrigation. Several changes have occurred in the irrigated area during the last six decades: (i) waterlogging and salinity, causing land degradation; (ii) poor drainage, resulting in declined crop production; (iii) shallow groundwater that meets about 40% of the irrigation water demand but is overexploited; and (iv) increased water-related disaster risks, including floods, droughts, and water quality degradation. Over the same period, agricultural drainage, waterlogging, and urban and industrial wastewater have significantly increased the marginal-quality water, which needs appropriate management for safe use and disposal.

2. Comprehensive management of water resources and water-related disasters requires operationalizing integrated water resources management (IWRM) and water-related disaster risk management (DRM) approaches. These are beyond the mandate and capacity of PID in its traditional role of irrigation water delivery. Further, cross-sector water competition causes conflicts among water users. This capacity development technical assistance (TA) was included in the country operations business plan for Pakistan, 2015–2017 of the Asian Development Bank (ADB)[1] through an extensive consultation process.[2] During consultation missions (19–27 March 2015 and 14–28 March 2016), ADB conducted meetings with PID—the executing agency—and other stakeholders, including civil society representatives, academics, and independent consultants. The executing agency and the Government of Punjab concurred with the impact, outcome, outputs, implementation arrangements, cost and financing arrangements, and terms of reference for consultants. The design and monitoring framework is in Appendix 1.

II. ISSUES

3. The century-old PID is not capable of managing diversified and complex water issues (para. 1) and has no capacity to operationalize emerging approaches such as IWRM and DRM (para. 2). The piecemeal efforts of irrigation reforms by ADB and partners during 1998–2013 were not fully successful. Thus, a comprehensive policy and institutional review and a complete transformation of PID into a responsive water resources department (WRD) are required. ADB's country partnership strategy, 2015–2019 for Pakistan[3] focuses on six sectors. For agriculture, which encompasses irrigation (irrigated agriculture produces 90% of the food in Pakistan),[4] the country partnership strategy emphasizes institutional effectiveness to enhance productivity and is in line with the Pakistan Vision 2025,[5] which emphasizes water, energy, and food security. Punjab's midterm development framework, 2015–2018[6] prioritizes reliable irrigation supplies, enhanced agricultural productivity, improved rural economy, and broad-based institutional reforms.

4. The World Bank initiated irrigation and drainage reforms through sector investment project[7] and policy loans.[8] The Japan International Cooperation Agency also supported the

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1 ADB. 2014. *Country Operations Business Plan: Pakistan, 2015–2017*. Manila.
2 The TA first appeared in the business opportunities section of ADB's website on 4 July 2016.
3 ADB. 2015. *Country Partnership Strategy: Pakistan, 2015–2019*. Manila.
4 A.S. Qureshi and A. Fatima. 2012. Sustaining Irrigated Agriculture for Food Security: A Perspective from Pakistan. Paper presented at the Pakistan Engineering Congress on the occasion of World Water Day. Lahore. 24 March.
5 Government of Pakistan, Ministry of Planning, Development, and Reform. 2015. *Pakistan Vision 2025 One Nation – One Vision*. Islamabad.
6 Government of Punjab, Planning and Development Department. 2015. *Medium-Term Development Framework, 2015–2018*. Lahore.
7 World Bank. 2007. *Implementation Completion and Results Report on a Credit in the amount of SDR 198.4 Million to Islamic Republic of Pakistan for a National Drainage Project*. Washington, DC.

implementation of irrigation reforms in some canal command areas.[9] ADB has been supporting the reforms through the ongoing multitranche financing facility for the Punjab Irrigated Agriculture Investment Program.[10] The TA will review all these reforms, and related plans and actions, and will integrate them as appropriate into the transformation process of PID into a WRD.

5. The TA is necessary to develop a framework and action plan for institutional transformation, and contribute to the sustainability of the investment program. It will support full transformation of PID based on the previous and ongoing reforms (para. 4). However, the TA will not be able to support the complete modernization of the WRD due to time and financial constraints, hence a TA loan will be required to support the medium- to long-term needs of the institutional transformation.[11] The TA loan will include upgrading research and development facilities, capacity building, and a project preparatory facility to prepare new projects.

III. THE CAPACITY DEVELOPMENT TECHNICAL ASSISTANCE

A. Impact and Outcome

6. The impact will be aligned with increased water and food security, and reduced water-related disaster risks through improved water policy and institution. The outcome will be the comprehensive management of Punjab's water resources and water-related disaster risks. The outcome will be monitored through (i) the adoption of basin-based IWRM[12] and water-related DRM approaches by the new WRD; and (ii) the approval of an act to enforce levies, cost recovery, and licensing practices by the Government of Punjab by 2019. The TA will achieve improved capacity of the WRD in (i) planning; (ii) developmental research and operational management; (iii) irrigation and drainage; (iv) water-related DRM; (v) river ecosystem; (vi) groundwater management; and (vii) marginal quality water management.

B. Methodology and Key Activities

7. The TA outputs are as follows: (i) the new WRD is functional, and (ii) the capacity of the WRD is enhanced. The outputs are strongly related to the outcome through a functional WRD and improved policy legislation, and capacity of the staff. The outputs will be achieved through (i) a review of ongoing and past reforms initiatives and lessons learned; (ii) a needs assessment for better technical, institutional, and policy options; (iii) stakeholders' consensus building for the change through the transformation; and (iv) improvement in policy, legislation, and capacity building for effective change management. The (i) preparation of Punjab's Water Vision 2030 and water resources information system (WRIS); and (ii) introduction of basin-based management approaches of IWRM, water-related DRM, and information and communication

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[8] World Bank. 2010. *Implementation Completion and Results Report on the Sector Development Policy Loans in the amount of JPY 11,780 Million and in the amount of US$ 100 Million to the Islamic Republic of Pakistan for Punjab Irrigation Sector Development Policy Loan for the Province of Punjab.* Washington, DC.

[9] JICA. Activities in Pakistan for Strengthening Irrigation Management System Including Agriculture Extension through Farmers' Participation in the Punjab Province. https://www.jica.go.jp/pakistan/english/activities/activity02_23.html (accessed 27 October 2016).

[10] ADB. 2006. *Report and Recommendation of the President to the Board of Directors: Proposed Multitranche Financing Facility to the Islamic Republic of Pakistan for Punjab Irrigated Agriculture Investment Program.* Manila.

[11] WRD will require modernization of both institution and infrastructure, including laboratories, research, modeling, and water monitoring facilities; and advanced staff training on water resource planning, hydroinformatics, and climate change impacts.

[12] IWRM approach will allow improved basin planning through close monitoring and evaluation of the actions for improved management and sustainable development.

technology in resource management will help achieve sustainable management of the water resources.

8. Output 1 will (i) support comprehensive review of all the water-related sectors and subsectors; (ii) assess the transformation needs; (iii) identify technical and institutional gaps; (iv) advise on technical, institutional, and policy options; (v) develop new organizational structure of the WRD; and (vi) provide help for stakeholders' consultation and governmental approval processes.

9. Output 2 will (i) help prepare a water vision; (ii) carry out policy review; (iii) 10–20 years investment programs and institutional transformation plans; (iv) process a TA loan to support and strengthen the institutional transformation; and (v) support capacity building, including promotion of the quality infrastructure investment.

10. Output 2 will also help develop a WRIS using satellite-based remote sensing technology and a geographic information system for cost-effective monitoring, evaluation, and management of the water resources. The WRIS will provide information on water resources, flood and drought risks, and irrigation-related assessment in close collaboration with the Japan Aerospace Exploration Agency. The WRIS will be an integral part of the institutional transformation. A delay in the approval process by the government is considered the main risk.

C. Cost and Financing

11. The TA is estimated to cost $3,070,000, of which $500,000 will be financed on a grant basis by ADB's Technical Assistance Special Fund (TASF-V) and $2,000,000 will be financed on a grant basis by the Japan Fund for Poverty Reduction and administered by ADB. The government will provide a cash contribution of $100,000 equivalent, which will not be transferred to ADB, and counterpart support in the form of counterpart staff, office space and field accommodation, secretarial assistance, use of PID's facilities, access to data, and other in-kind contributions. The cost estimates and financing plan are in Appendix 2.

D. Implementation Arrangements

12. PID will be the executing agency for the TA. ADB will implement the TA in close consultation with PID during January 2017–December 2019. The Punjab Planning and Development Department will oversee the TA implementation.

13. PID will provide support in the form of counterpart staff, office space and field accommodation, secretarial assistance, use of its facilities, access to data, and coordination with other departments and agencies in the Government of Punjab.

14. PID is committed and has already started (i) developing a basin-based IWRM approach, (ii) reviewing the legal framework for institutional transformation, (iii) reviewing ongoing irrigation and drainage reforms, and (iv) establishing a hydraulic structures safety evaluation unit using its own resources.

15. Consultancy services for (i) change management, (ii) revitalizing research and development, and (iii) capacity building will be provided through individual consultants and an international firm. The terms of reference for consultants are in Appendix 3. The individual consultants will act as a core group and will be housed in PID office for effective communication and coordination and support. The TA coordinator and deputy TA coordinator will steer and

guide the transformation process. Individual consultants will also be recruited to develop a satellite-based WRIS. For technical, institutional, and policy-related inputs, a firm will be hired to provide support in the fields of IWRM, flood and drought, dams, and irrigation and drainage. The firm will be selected using the quality-based selection method, as (i) the assignment is complex and highly specialized, making it difficult to define precise terms of reference and the required inputs from the consultants; and (ii) the downstream impact is large and the quality of the services will be of overriding importance for the outcome of the TA. Services of appropriately qualified resource persons from ADB or elsewhere will be used to conduct workshops and share knowledge on the WRIS and quality infrastructure investment.

16. Provisional sums for enhancing research capabilities and upgrading research facilities including the Irrigation Research Institute of PID and groundwater modeling will be provided. Several relevant international hydraulic research institutes have been identified to help in the hydraulic research and training, including Deltares (the Netherlands), HR Wallingford (United Kingdom), UNESCO-IHE Institute for Water Education (the Netherlands), Asian Institute of Technology (Thailand), International Water Centre (Australia), and International Centre for Water Hazard and Risk Management (Japan). The training coordinator will be paid from the contribution of the Government of Punjab to this TA. The international hydraulic research institutes will be recruited through the consultants' qualification selection method, as the assignment is highly specialized and only a few qualified institutes are available; evaluation of competitive proposals is therefore not justified.

17. Best international practices of change management will be thoroughly analyzed by the government, ADB, and the consultant team before recommending any new ideas for transformation. The consultants will work closely with the government through sharing office, frequent consultation, and stakeholders' consultation workshops to avoid any setbacks or surprises.

18. Consultants will be engaged by ADB in accordance with its Guidelines on the Use of Consultants (2013, as amended from time to time). The TA funds will be disbursed in accordance with ADB's *Technical Assistance Disbursement Handbook* (2010, as amended from time to time). All equipment under the TA will be procured in accordance with ADB's Procurement Guidelines (2015, as amended from time to time).

19. Dissemination of the expected outputs and outcome will be done through knowledge products, PID's knowledge portal, as well as by inviting representatives from other provinces in Pakistan to participate in workshops and seminars.

IV. THE PRESIDENT'S DECISION

20. The President, acting under the authority delegated by the Board, has approved (i) ADB administering a portion of technical assistance not exceeding the equivalent of $2,000,000 to be financed on a grant basis by the Japan Fund for Poverty Reduction; and (ii) ADB providing the balance not exceeding the equivalent of $500,000 on a grant basis, to the Government of Pakistan for Institutional Transformation of the Punjab Irrigation Department to a Water Resources Department, and hereby reports this action to the Board.

DESIGN AND MONITORING FRAMEWORK

Impact the Technical Assistance is Aligned With:

Increased water and food security, and reduced water-related disaster risks through improved water policy and institution. (Medium-Term Development Framework, 2015–2018; Pakistan Vision 2025)[a]

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
Outcome Comprehensive management of Punjab's water resources and water-related disaster risks	By 2019: a. Adoption of basin-based IWRM and water-related disaster risk management approaches by the new WRD (2015 baseline: none) b. Approval of an act to enforce levies, cost recovery, and licensing practices by the Government of Punjab (2015 baseline: none)[b]	a. WRD annual report and website b. Promulgation of the act	Government does not fully implement the institutional transformation as a means to achieve water and food security in Punjab.
Outputs 1. New WRD is functional	1a. Organizational structure, policy and planning, business rules, licensing and cost-recovery mechanisms, and agreed transformation plan for the new WRD are available by Q1 2018 (2015 baseline: none) 1b. The Government of Punjab endorses the new WRD starting in Q3 2018 (2015 baseline: none) 1c. Budget allocated to the new WRD for FY2020 by Q2 2019 (2015 baseline: none) 1d. Newly recruited staff comprising up to 30% women by Q2 2019 (2015 baseline: None).	1a. Reports, workshops proceedings, and major agreements 1b. Government of Punjab's notification 1c. Punjab annual budget for FY2020 1d. Executing agency's quarterly progress report	Government of Punjab delays approval of the new WRD.
2. Capacity of the WRD is enhanced	2a. Punjab's Water Vision 2030 launched by Q4 2018 (2015 baseline: none)	2a. Punjab Irrigation Department's knowledge portal	

Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting Mechanisms	Risks
	2b. WRIS and its operation manual available by Q3 2018 (2015 baseline: none) 2c. At least 50 staff (including women) from the WRD trained on governance, IWRM, water-related disaster risk management, information and communication technologies, remote sensing, and geographic information systems by Q3 2018 (2015 baseline: none)	2b–2c. Executing agency's quarterly progress report	

Key Activities with Milestones

1. New WRD is functional.
1.1 Recruit and mobilize consultants by Q2 2017.
1.2 Develop WRD plans, including organizational structure, by Q1 2018.
1.3 Support the Government of Punjab's approval process, including FY2020 budget for new WRD, by Q1 2019.
1.4 Recruit new staff for WRD by Q1 2019.

2. Capacity of WRD enhanced.
2.1 Develop WRD's capacity building plan by Q4 2017.
2.2 Deliver training programs by Q2 2018.
2.3 Develop WRIS and draft operations manual by Q2 2018.
2.4 Draft Punjab's Water Vision 2030 by Q3 2018.
2.5 Start processing of technical assistance loan by Q1 2018.

Inputs

ADB: $500,000

Japan Fund for Poverty Reduction: $2,000,000

Government of Punjab: $100,000

Note: The government will provide a cash contribution of $100,000 equivalent, which will not be transferred to ADB, and counterpart support in the form of counterpart staff, office space and field accommodation, secretarial assistance, use of the Punjab Irrigation Department's facilities, access to data, and other in-kind contributions.

Assumptions for Partner Financing

Not applicable.

ADB = Asian Development Bank, IWRM = integrated water resources management, Q = quarter, WRD = Water Resources Department, WRIS = water resources information system.

[a] Government of Punjab, Planning and Development Department. 2015. *Medium-Term Development Framework, 2015–2018.* Lahore; Government of Pakistan, Ministry of Planning, Development and Reform. 2015. *Pakistan Vision 2025 One Nation – One Vision.* Islamabad.

[b] Existing Canal and Drainage Act of 1873 does not cover this aspect.

Source: Asian Development Bank.

COST ESTIMATES AND FINANCING PLAN

($'000)

Item	Amount
A. Asian Development Bank[a]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	134.9
ii. National consultants	110.0
b. International and local travel	19.0
c. Reports and communications	5.0
2. Equipment[b]	15.0
3. Training, seminars, and conferences[c]	25.0
4. Provisional sums	150.0
5. Miscellaneous administration and support costs	1.0
6. Contingencies	40.1
Subtotal (A)	**500.0**
B. Japan Fund for Poverty Reduction[d]	
1. Consultants	
a. Remuneration and per diem	
i. International consultants	1,042.1
ii. National consultants	441.6
b. International and local travel	145.0
c. Reports and communications	8.0
2. Equipment[b]	42.5
3. Training, seminars, and conferences[c]	100.0
4. Miscellaneous administration and support costs	20.8
5. Contingencies	200.0
Subtotal (B)	**2,000.0**
Total (A+B)	**2,500.0**

Note: The technical assistance (TA) is estimated to cost $3,070,000, of which contributions from the Asian Development Bank (ADB) and the Japan Fund for Poverty Reduction are presented in the table above. The government will provide a cash contribution of $100,000 equivalent, which will not be transferred to ADB, and counterpart support in the form of counterpart staff, office space and field accommodation, secretarial assistance, use of the Punjab Irrigation Department's facilities, access to data, and other in-kind contributions. The value of government contribution is estimated to account for 18.6% of the total TA cost.

[a] Financed by ADB's Technical Assistance Special Fund (TASF-V).

[b] Type of equipment includes purchase of computers, servers, software, and photocopiers. The item will also cover car leases. Equipment purchased under the TA will be handed over to the executing agency upon completion of the TA.

[c] Also includes airfare, accommodation, per diem, and other miscellaneous travel expenses for qualified resource persons among ADB staff.

[d] Administered by ADB.

Source: Asian Development Bank estimates.

OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

A. General

1. The consultancy services will be provided through individual consultants and an international firm. A core group of individual consultants will be established to work together with the Punjab Irrigation Department (PID). A total of 175 person-months of consulting services and counterpart staff inputs of 142 person-months will support the technical assistance (TA) implementation.

B. Major Outputs and Activities

2. The major outputs and activities are summarized in Table A3.1.

Table A3.1: Summary of Major Outputs and Activities

Major Activities by Core Group, Firm WRIS Team, and IHRI	Expected Completion Date	Major Outputs	Expected Completion Date
Review of all the water-related subsectors, asset management, river basins, water demand and supply, and cost-recovery mechanisms	31 Jul 2017	Working papers on subsectors Revised reports on asset management, water supply and demand, and cost recovery	30 Sep 2017 31 Oct 2017
Review and needs assessment (capacity building and research)	31 Jul 2017	Report	30 Sep 2017
Develop self-sustained research for development program	31 Oct 2017	Reports	31 Dec 2017
Develop Punjab's water vision and medium-term development and investment plan	31 Jan 2018	River basins plans Punjab's Water Vision 2030; and list of priority projects	30 Jun 2018 30 Sep 2018
Develop organizational structure and functions, and legislative requirements for new WRD	31 Mar 2018	Report agreed with PID	30 Sep 2018
Develop technical, institutional, and policy option models for river basins, flood, irrigation, drainage, groundwater and marginal-quality water, and conduct pilot tests of their structure and functions	30 Jun 2018	Theoretical and working models; and pilot demonstrations of module	31 Dec 2018
Develop WRIS for Punjab	30 Jun 2018	Functional WRIS model	30 Sep 2018
Support of loan processing	31 Dec 2018	Processing documents	31 Mar 2019
Trainings	30 Jun 2018	Trained staff	30 Sep 2018
Final workshop	31 Mar 2019	Final report	30 Apr 2019
Research and development infrastructure and hydraulic research upgraded	31 Mar 2019	New research and development on work	30 Jun 2019
All activities under the technical assistance completed	31 Mar 2019	Operational WRD	30 Sep 2019

IHRI = international hydraulic research institute, PID = Punjab Irrigation Department, WRD = Water Resources Department, WRIS = water resources information system.
Source: Asian Development Bank estimates.

C. Consulting Services

3. The person-month requirements are in Table A3.2.

Table A3.2: Summary of Consulting Services Requirements
(person-months)

Position	International	National	Counterpart Staff
A. Core Group: Individual Consultants			
Water resources specialist and TA coordinator	10	0	24
Irrigation water management specialist and deputy TA coordinator	0	20	0
Legal specialist (water resources)	0	4	0
Financial management reform specialist	0	6	6
Human resources specialist and training coordinator	0	12	12
Subtotal (A)	**10**	**42**	**42**
B. Firm: International Management Consultant			
River basin specialist and team leader	12	0	12
River basin planning specialist	0	10	12
Flood risk management specialist	6	12	18
Irrigation water management and reform specialist	6	10	12
Drainage assessment and management specialist	4	6	12
Groundwater and drought management specialist	6	8	12
Spate (hill torrents) irrigation specialist	4	6	12
Modeling specialist	4	0	0
Unallocated	6	9	0
Subtotal (B)	**48**	**61**	**90**
C. Water Resources Information System			
Water information management specialist	3	0	10
Remote sensing specialists 1 and 2	5	0	0
Geographic information system specialist	0	6	0
Subtotal (C)	**8**	**6**	**10**
Total (A+B+C)	**66**	**109**	**142**

Note: A $150,000 lump-sum payment will be allocated for the international hydraulic research institute, and another $100,000 lump-sum payment will be allocated for training (covered by cash contribution from the Government of Punjab).
TA = technical assistance.
Source: Asian Development Bank estimates.

4. The outline terms of reference for consultant inputs (individual consultants for the core group, firm, and other consultants) under the TA are described in paras. 5–19.

1. Core Group: Individual Consultants

5. **Water resource specialist and TA coordinator (international, 10 person-months) and irrigation water management specialist and deputy TA coordinator (national, 20 person-months).** The coordinators should have a master's degree in the field of water resources or a related discipline and have 15 years of water resource institutional development experience. The coordinators will (i) provide overall direction to the team of specialists and coordinate TA inputs, (ii) act as change management agents and facilitate the transformation process, (iii) liaise with the government and other key stakeholders, (iv) be responsible for compilation of all outputs in a timely manner, (v) coordinate for a water resources information system (WRIS), and (vi) assist the executing agency in processing the TA loan with inputs from the other experts.

6. **Legal specialist (water resources) (national, 4 person-months).** The specialist should have a bachelor's degree and registered counsel. The specialist will (i) review the existing institutional and legal practices, and (ii) advise new institutional and legislative requirements and help their processing.

7. **Financial management reform specialist (national, 6 person-months).** The specialist should have a master's degree in the field of finance or a related discipline and have 7 years of

relevant experience. The specialist will (i) assess the financial management system, (ii) identify gaps, and (iii) advise on a robust and transparent system.

8. **Human resources specialist and training coordinator (national, 12 person-months).** The specialist and training coordinator should have a bachelor's degree in social or applied science or a related discipline and have 7 years of relevant experience. The specialist will (i) review the existing human resources policy, efficiency, and capacity; (ii) identify gaps; and (iii) advise on a more robust, transparent, and efficient human resources system, including career progression.

2. Firm: International Management Consultant

9. **River basin specialist and team leader (international, 12 person-months) and river basin planning specialist (national, 10 person-months).** The specialists should have master's degree in water resources or a related discipline and have 10 years of relevant experience. The specialists will (i) develop technical, institutional, and policy options; (ii) prepare an integrated river basin planning framework; (iii) conduct sector analysis; (iv) develop Punjab's water vision 2030; and (v) coordinate the firm's collective inputs and outputs. The specialists will also provide all the necessary help to develop a WRIS.

10. **Flood risk management specialists (international, 6 person-months; national river engineer, 12 person-months).** The specialists should have a bachelor's degree in civil engineering or a related discipline and have at least 7 years of relevant experience, including in flood flow modeling. The specialists will (i) review flood risk management-related technical, institutional, and policy options; (ii) develop a framework for flood risk reduction in basins at the provincial level; (iii) set up a flow and flood forecasting model for one river basin; and (iv) recommend best technical, institutional, and policy options for flood risk management, including needed cultural and social changes.

11. **Irrigation water management and reform specialists (international, 6 person-months; national, 10 person-months).** The specialists should have a bachelor's degree in engineering or a related discipline and have 10 years of experience in institutional reforms. The specialists will (i) review ongoing reforms, and (ii) advise an appropriate mechanism for improved irrigation service delivery and needed cultural changes.

12. **Drainage assessment and management specialists (international, 4 person-months; national, 6 person-months).** The specialists should have a bachelor's degree in engineering or a related discipline and have 10 years of experience in drainage management. The specialists will (i) review the efficiency and effectiveness of the provincial drainage system; and (ii) advise on sustainable solutions, including policy and institutions, within the prevailing cultural context.

13. **Groundwater and drought management specialists (international, 6 person-months; national, 8 person-months).** The specialists should have a bachelor's degree in civil engineering or a related discipline and have 10 years of relevant experience. The specialists will (i) review current groundwater use practices; (ii) develop a groundwater modeling and sustainable use management framework; and (iii) recommend best technical, institutional, and policy options, including planning, designing, monitoring, and evaluation in the prevailing cultural context.

14. **Spate (hill torrents) irrigation specialists (international, 4 person-months; national, 6 person-months).** The specialists should have a bachelor's degree in civil engineering or related disciplines and have 10 years of relevant experience. The specialists will (i) review hill torrent spate irrigation; and (ii) recommend best technical, institutional, and policy options and climate change adaptation measures in the prevailing cultural context.

15. **Modeling specialist (international, 4 person-months).** The specialist should have a bachelor's degree in civil engineering, computer sciences, or water resources and have 5 years of relevant experience. The specialist will (i) set up a modeling unit in the PID, (ii) develop a pilot flow and flood simulation model for Chenab River Basin, and (iii) provide on-the-job training to PID staff.

3. Water Resources Information System

16. **Water information management specialist (international, 3 person-months)**. The specialist should have a bachelor's degree or higher in civil engineering or a related discipline and have at least 10 years of relevant experience. The specialist will (i) have overall responsibility for developing the WRIS and provide technical guidance to the WRIS team, (ii) develop the WRIS; (iii) develop an operation manual for the WRIS, and (iv) organize a knowledge-sharing event.

17. **Remote sensing specialist 1 (international, 2 person-months) and 2 (international, 3 person-months).** The specialists should have a bachelor's degree or higher in remote sensing technology or a relevant field and have a minimum of 5 years of relevant experience. The specialists will (i) develop the WRIS, (ii) conduct geospatial analyses, and (iii) conduct trainings.

18. **Geographic information system specialist (national, 6 person-months).** The specialist should have a bachelor's degree or higher in the field of information and communication technology or a comparable discipline and have a minimum of 5 years relevant experience. The specialist will (i) develop an end-user interface for the WRIS with a web-based geographic information system, and (ii) conduct trainings.

4. International Hydraulic Research Institute

19. The international hydraulic research institute will (i) assess existing research, including from PID's Irrigation Research Institute, flood and flow forecasting, strategic planning, and capacity building needs; (ii) identify gaps and constraints and future challenges, in particular in hydraulic research, and groundwater and drainage; and (iii) recommend technical, institutional, and policy options and capacity building for research in scale and mathematical modeling.

D. Implementation Arrangements

20. The TA processing and implementation schedule is in Table A3.3.

Table A3.3: Technical Assistance Processing and Implementation Schedule

Major Milestones	Expected Completion Date
Mobilization of consultants	31 May 2017
Final report	30 April 2019
Technical assistance completion	30 September 2019

Source: Asian Development Bank.